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men that did not show the mixture of *Mexicanus*, from any part of the Missouri water-shed beyond the strict limits of the Eastern Province. But at the Rocky Mountains this mongrel breed runs up north into the Saskatchewan region at least, if not farther. In latitude this is more than abreast of the Mouse River area where *auratus* flourishes untouched with red. I have specimens of various grades of "hybridity" from the mountains where the St. Mary's, the Kootenay (or Kootanie) the Belly and other tributaries of the northern waters arise.

Audubon's warbler (*Dendroæca Auduboni*) breeds in the Rocky Mountains at the locality lately specified. Several very young birds were shot in August.

There is something I have not quite made out respecting the breeding range of Sprague's lark, *Neocorys Spraguei*. The bird can hardly be more abundant anywhere than it is in the country west of the Red River and north of the Missouri Coteau. I certainly saw several thousand last year. The present season, at the site of Fort Union (Audubon's original locality), and thence up the Missouri to the mouth of Milk River, I noticed altogether a few hundred perhaps. But the birds were not common, and in all the country west of this I saw none at all until I came upon the head of Milk River, just at the ridge that divides these waters from those of the Saskatchewan. There, among the foothills of the Rockies, the species reappeared. Much the same peculiarity attaches to the breeding range of Baird's bunting. This bird is everywhere over the Mouse River region, and the type came from the Upper Missouri, but during the summer just passed I have failed to find a single one in the whole country from the mouth of the Yellowstone to the headwaters of the Saskatchewan.—*Fort Benton, Montana, Sept. 9, 1874.*

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## THE COLOSSAL CEPHALOPODS OF THE NORTH ATLANTIC. II.

BY PROF. A. E. VERRILL.

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AFTER the first part of this article was printed, I received an interesting letter from the Rev. Mr. Harvey, who, in accordance with my request, has made a new examination of the large arm of

"No. 2," preserved in the Museum at St. John's, N. F. He states, in this letter, that all the suckers were originally denticulated around the margin, as suggested by me in the last number of the *NATURALIST*, and that this fact was previously overlooked on account of the mutilation it had undergone. He has also furnished to me a full series of measurements of its various parts. It has contracted excessively in the alcohol, and is now only thirteen feet and one inch in length (instead of nineteen feet, its original length), the enlarged sucker-bearing portion being two feet and three inches; the large suckers occupy twelve inches; the terminal part bearing small suckers, nine inches; circumference of slender portion 3.5 to 4.25 inches; of largest part 6 inches; breadth of face, among large suckers, 2.5 inches; from face to back, 1.62 inches; diameter of largest suckers outside, .75 of an inch; inside, .63 of an inch. It will be evident from these measurements, when compared with those made while fresh and from the photograph, that the shrinkage has been chiefly in length, the thickness remaining about the same, but the suckers are considerably smaller than the dimensions previously given.

Mr. Harvey also mentions that a specimen was cast ashore at Bonavista Bay, December, 1872, and his informant says that the long arms measured thirty-two feet in length, and the short arms about ten feet in length, and were "thicker than a man's thigh." The body was not measured, but he thinks it was about fourteen feet long, and very stout, and that the largest suckers were 2.5 inches in diameter. The size of the suckers is probably exaggerated, and most likely the length of the body also. It is even possible that this was the same specimen from which the beak and suckers described in my last article, as No. 4, from Bonavista Bay, were derived, for the date of capture of that specimen is unknown to me. The latter, however, was much smaller than the above measurements of the former would admit, and it will, therefore, be desirable to give this one a special number (11).

Another specimen, which we may designate as No. 12, was cast ashore this winter, near Harbor Grace, but was destroyed before its value became known, and no measurements are given.

*Architeuthis princeps* Verrill, sp. nov., figures 25, 26, 27. This species is based on the lower jaw mentioned as No. 1 in my former papers, and on the upper and lower jaws designated as No. 10, in the first part of this article; besides these jaws we only have the

rough measurements of the body of No. 4, and an estimate of the diameter of the sessile arms. The jaws of No. 10 were obtained from the stomach of a sperm whale taken in the N. Atlantic, and were presented to the Essex Institute by Capt. N. E. Atwood, of Provincetown, Mass., but the date and precise locality of the cap-

Fig. 25.

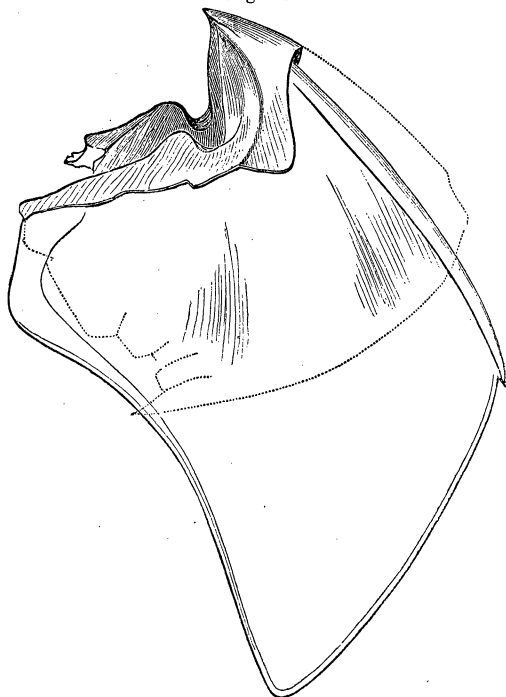


Upper jaw of *Architeuthis princeps* Verrill. No. 10. Natural size.

ture are unknown. The form of these jaws is well shown in figures 25 and 26. The total length of the upper jaw (fig. 25) is 5 inches; greatest breadth, 1.45; front to back 3.5 inches; width of palatine lamina, 2.32. The frontal portion is considerably broken, but the dorsal portion appears to extend nearly to the

posterior end, the length from the point of the beak to the posterior edge being 3·4 inches. The texture is firmer and the lamina are relatively thicker than in *A. monachus*. The rostrum and most of the frontal regions are black and polished, gradually becoming orange-brown and translucent toward the posterior border, and marked with faint striæ radiating from the tip of the beak, and

Fig. 26.



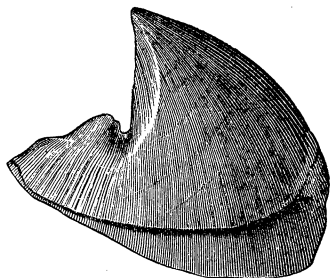
Lower jaw of *Architeuthis princeps*. No. 10. Natural size. The dotted line shows the portions that are present on the back side.

by faint ridges or lines of growth parallel with the posterior margin; a slight but sharp ridge extends backward from the notch at the base of the cutting edge, and other less marked ones from the anterior border of the alæ. The tip of the beak is quite strongly curved forward, and acute, with a slight shallow groove, commencing just below the tip, on each side, and extending backward only a short distance and gradually fading out. The cutting edge is nearly smooth and well curved, the curvature being greatest toward the tip; at its base there is a broad angular notch, deepest

externally. The inner face of the rostrum is convex in the middle and concave or excavated toward the margins, which are, therefore, rather sharp. The anterior borders of the alæ are convex, or rise into a broad, but low, lobe or tooth beyond the notch, but beyond this they are nearly straight, but with slight, irregular lobes, which do not correspond on the two sides. The anterior edges of the alæ make nearly a right angle with the cutting edges of the rostrum. The palatine lamina is broad, thin, and dark brown, becoming reddish brown and translucent posteriorly, with a thin, whitish border. The surface is marked with unequal divergent striæ and ridges, some of which, especially near the dorsal part, are quite prominent and irregular; the posterior border has a broad emargination in the middle, but the two sides do not exactly correspond. The lower jaw (fig. 26) was badly broken, and many of the pieces, especially of the alæ, are lost, but all that remain have been fitted together. The extreme length is 3.63 inches; the total breadth, and the distance from front to back, cannot be ascertained, owing to the absence of the more prominent parts of the alæ; from tip of beak to posterior dorsal border of mentum, 1.68; from tip of beak to posterior lateral border of alæ, 2.20; from tip of beak to posterior dorsal border of gular lamina, 2.37; from tip of beak to bottom of notch at its base, .80; tip of beak to inner angle of gular lamina, 1.85; height of tooth from bottom of notch, .25; breadth between teeth of opposite sides, .60; from front to back of gular lamina, in middle, 1.75. The rostrum is black, with faint radiating striæ, and with slight undulations parallel with the posterior border; the beak is acute, slightly incurved, with a notch near the tip, from which a very evident groove runs back for a short distance, while a well marked, angular ridge starts from just below the notch, and descends in a curve to the ala, opposite the large tooth, defining a roughened or slightly corrugated and decidedly excavated area, between it and the cutting edges; the cutting edge below this ridge is nearly straight, or slightly convex; the notch at its base is rounded and deep and strongly excavated at bottom; the tooth is broad, stout, obtusely rounded at summit, sloping abruptly on the side of the notch, and gradually to the alar edge. The anterior edge of the alæ, beyond the tooth, is rounded and strongly obliquely striated: it makes, with the cutting edge, an angle of about  $110^{\circ}$ . The inner surfaces of the two sides of the internal plate of the rostrum form an angle of about  $45^{\circ}$ .

The lower jaw of No. 1 (fig. 27) is represented only by its anterior part, the alæ and gular laminæ having been cut away by the person who removed it. It agrees very well in form and color with the corresponding parts of the one just described, but is somewhat smaller. The lateral ridges of the rostrum are rather more prominent, and the area within it is narrower and more deeply excavated, especially at the base of the notch, where the excavation goes considerably lower than the inner margin. The notch is narrower and not so much rounded at its bottom. The tooth is about the same in size as that of No. 10, and appears to be even more prominent, because the edge of the alæ is more concave at its outer base; it is also more compressed and less regularly rounded at summit; the anterior edge of the alæ seems to rise into another low lobe beyond the concave portion. This jaw measures 1·30 inches from the tip to the posterior dorsal border of mentum; ·65 from tip to the bottom of the notch; ·16 from bottom of notch to tip of the tooth.

Fig. 27.

Part of lower jaw of *Architeuthis princeps*. No. 1. Nat. size.

Both these lower jaws agree in having a very prominent tooth on the alar edge, with a large and deeply excavated notch between it and the cutting edge, and in this respect differ from the two lower jaws of *A. monachus* in my possession, for in the latter the tooth or lobe is low and broad, and scarcely prominent, while the notch is narrow and shallow. This seems to be the best character for distinguishing the jaws of the two species. But they also differ in the angle between the alar edge and the cutting edge of the rostrum, especially of the lower jaw, for while in *A. monachus* this is hardly more than a right angle, in *A. princeps* it is about 110°. Moreover, the darker color and firmer texture of the jaws of the latter seem to be characteristic.

The proportions of the body seem to be quite different, if we can judge by the measurements given of the specimen (No. 1) which was found dead and floating at the surface of the water, at the Banks of Newfoundland, by Capt. Campbell, of the schooner

B. D. Haskins, from Gloucester, Mass., in October, 1871.<sup>1</sup> It is stated that this specimen was measured, and that the body was fifteen feet long, and four feet and eight inches in circumference. The arms were badly mutilated, but the portions remaining were estimated to be nine or ten feet long and about twenty-two inches in circumference, two being shorter than the others. This would indicate a much more elongated form of body than that of *A. monachus*. If these proportions be correct, the body of No. 10 must have been about nineteen feet in length, and five feet and nine inches in circumference.

This specimen is probably the largest invertebrate hitherto actually examined by any naturalist. Larger cephalopods may possibly have been seen by mariners, but most of their statements of size are only rude estimates, and are nearly always much exaggerated.

*Notes on specimens described by other writers.* We are mainly indebted to Professor Steenstrup and to Dr. Harting for our knowledge of the specimens preserved in European museums, or cast ashore on the European coasts. Professor Steenstrup has given interesting accounts, compiled from contemporary documents, of a specimen taken in 1546, and of two specimens of huge cephalopods cast ashore at Iceland in 1639 and 1790; and has also described and figured<sup>2</sup> the jaws of another specimen of *A. monachus*, obtained at Jutland in 1853. In the same memoir, of which I have seen only the first part, there are references to a description and figures of *A. Titan*, obtained in 1855, by Capt. Hygom, in N. Lat. 31°; W. Long. 76°. The latter specimen appears to be the same that Harting<sup>3</sup> mentioned under the name of "*Architeuthis dux* Steenstrup," as collected at the same time and place, and of which he published an outline figure of the lower jaw, copied from a drawing furnished to him by Steenstrup. Harting states that the pen or "gladius" of this specimen is six feet long. Many important parts of this specimen were secured, and I

<sup>1</sup> See the American Naturalist, Vol. vii, p. 91, Feb., 1873.

<sup>2</sup> In a paper, of which I have only seen some proof-sheets, given by him to Dr. Packard, entitled "*Spolia Atlantica*." Whether this memoir has been published I do not know. The plate (I) that I have seen, is marked "Vid. Selsk. Skrifter V. Række, naturv. og mathem. Afd. iv, Bind;" and there are references to three other plates illustrating *A. Titan*, etc.

<sup>3</sup> Description de quelques fragments de deux Céphalopodes gigantesques. Publiées par l'Académie Royale des Sciences à Amsterdam. 1860. 4to, with three plates.

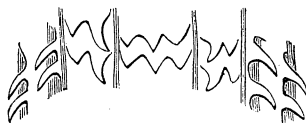


regret that I have been unable to see the figures and description of it, referred to by Harting as forming part of Prof. Steenstrup's memoir, then unpublished. But to judge by the outline figure given by Harting, it is a species quite distinct from those described above. The lower jaw resembles that of *A. monachus* more than *A. princeps*, and is a little larger than that of our No. 5 (see fig. 6). The beak is more rounded dorsally, less acute, and scarcely incurved, the notch is narrow, and the alar tooth is not prominent.

Harting, in the important memoir referred to, describes specimens of two species, both of which are evidently quite distinct from all those enumerated above.

The first of these (Plate I) is represented by the jaws and buccal mass, with the lingual dentition, and some detached suckers, preserved in the museum of the University of Utrecht, but from an unknown locality. These parts are well figured and described, and were referred to *Architeuthis dux* by Harting. But the character of the dentition (fig. 28) is so totally different from

Fig. 28.



Teeth of *Loligo Hartingii* Verrill. Enlarged.

what I have found in *A. monachus* that it will be necessary to refer this species to a different genus, if not to a distinct family. The form of the lower jaw is quite unlike that of *A. dux*, for the beak is very acute, the cutting edge is concave, the notch shallow and broad, and the alar tooth is somewhat prominent. The size is about the same as our No. 5. The suckers figured are from the sessile arms, and agree pretty nearly with those of *A. monachus* (see fig. 3). The edge is strengthened by an oblique, strongly denticulated ring. The internal diameter of the largest of these suckers is .75 of an inch; the external, 1.05 inches. They were furnished with slender pedicels, attached obliquely on one side. The lingual teeth (see fig. 28 copied from Harting,) are in seven regular rows, and resemble closely those of *Loligo* (fig. 9). In fact, I cannot find, in the figures and description, any character by which this species can be separated from *Loligo*, and at the same time it is evident that it is a species distinct from all others

known. I would, therefore, propose to designate it by the name of *Loligo Hartingii*.

The other species described by Harting was represented by the jaws and pharynx, an eye, a part of one of the sessile arms, and of one of the long tentacular arms, preserved in the museum of the Zoological Garden of Amsterdam. They were taken from the stomach of a shark, captured in the Indian Ocean. Harting referred this specimen to the genus *Enoploteuthis*, and doubtfully to the species described by Owen under the name of *E. unguiculata*, from a specimen in the Hunterian museum, collected between Cape Horn and Australia by Banks and Solander, on Capt. Cook's first voyage. The jaws of this species are very sharp and strongly incurved, and a little smaller than those of the *Loligo Hartingii*.

Instead of circular suckers with denticulated margins, the arms bear two rows of large sharp incurved hooks or claws, arising from large, swollen, muscular bulb-like bases, attached to the arms by short pedicels. The lingual dentition is also quite peculiar, but the teeth are arranged in seven rows, as usual.

Mr. Kent, in the article already referred to,<sup>4</sup> mentions a sessile arm of a giant cephalopod, which has been long preserved in the British Museum, but of which the origin is unknown. He states that it is 9 feet long; 11 inches in circumference at the base, tapering off to a fine point. There are from 145 to 150 suckers, in two alternating rows, those at the base being half an inch in diameter. The relatively small size of the suckers and great length of the arms show that this arm cannot belong to the same species as our *Architeuthis monachus*, which Mr. Kent thought probable. But as the arms of *A. princeps* and *Loligo Hartingii* are still unknown, it may belong to one of those species, or it may belong to the species observed, but not captured, by the officers of the "Alecton," in 1861, near Teneriffe, and named *Loligo Bouyeri* by Crosse and Fischer, but known only from the imperfect descriptions of it given by the officers, and a sketch of it prepared while the crew were making unsuccessful attempts to get it on board.

The body of this one was estimated at 15 to 18 feet in length, with the arms somewhat shorter.

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<sup>4</sup> Proceedings Zoological Society of London, for 1874, page 178.